PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES

Volume 54, No. 6, pp. 133–140, 23 figs. March 14, 2003

Four Species of the Spider Genus *Steatoda* (Araneae: Theridiidae) from the Gaoligong Mountains, Yunnan, China

Chang-Min Yin[1], Charles E. Griswold[2], You-Hui Bao[1] and Xiang Xu[1]

[1] *College of Life Science, Hunan Normal University, Changsha, Hunan Province 410081 P. R. China;*
[2] *California Academy of Sciences, San Francisco, California 94118, U.S.A.*

Four species of the genus *Steatoda* are described from the Gaoligong Mountains region of Yunnan Province, China. Three new species, i.e., *Steatoda mainlingoides*, *Steatoda pardalia*, and *Steatoda tortoisea*, are described as is the previously unknown female of *Steatoda terostiosa* Zhu, 1998.

There are 16 species of the genus *Steatoda* known from China (Zhu 1998; Platnick 2002). In this paper we describe three new species and the hitherto unknown female of *Steatoda terostiosa* Zhu, 1998, which were collected in the Gaoligong Mountains by the first and second Sino-America expeditions, 1998 and 2000 respectively. The type specimens are deposited in the College of Life Science, Hunan Normal University, and some paratypes are in California Academy of Sciences.

Materials and Methods

Specimens were fixed in 75% ethanol for 24 hours, then transferred to 85% ethanol for preservation. Vulvae were cleared in lactic acid. Examination was via an Olympus Tokyo BH-2 stereomicroscope. The following leg segment measurements were taken (femur, patella + tibia, metatarsus, and tarsus) and these measurements summed to give total length. All measurements are in mm. All length and width measurements are of the largest dimension of the structure in question. All scale bars equal 1.0 mm except figs. 22 and 23 in which they equal 0.1 mm.

Abbreviations used.— AER=anterior eye row; ALE=anterior lateral eye, AME=anterior median eye, MOQ=median ocular quadrangle, MOQA=MOQ anterior, MOQP=MOQ posterior, PER=posterior eye row, PLE=posterior lateral eye, PME=posterior median eye, PME-PME=interval between PMEs, PME-PLE=interval between PME and PLE.

Steatoda mainlingoides, new species

Figures 1–8

Types.— Holotype ♀ and paratype ♂ from native forest at pass over Gaoligongshan at 2100m, Nankang, 36 air km SE TengChong, 24°50′ N, 98°47′ E, Baoshan Prefecture, Yunnan, China, collected 4–7 October 1998 by C. Griswold, D. Kavanaugh and C.-L. Long, deposited in HNU (No. 98-TC-7).

Etymology.— The specific name refers to its similarity to *Steatoda mainlingensis* (Hu and Li 1987).

Diagnosis.— This new species is similar to *Steatoda mainlingensis*, but can be distinguished by: (1) the narrow median markings on the abdominal dorsum (Fig. 1), whereas that of *S. mainlin-*

gensis has broad median and posterior triangles (Zhu 1998: fig. 229A); (2) the subtriangular epigynum (Fig. 5), whereas that of *S. mainlingensis* is ellipsoid (Zhu 1998: fig. 229B); (3) the vulval tube is longer and curved (Fig. 8), whereas that of *S. mainlingensis* is very short and straight; and (4) the S-shaped conductor and short embolus of male palpal organ (Figs. 2, 3) are very different from *S. mainlingensis* (Zhu 1998: fig. 229D, E).

Female.— Carapace and sternum black. Carapace integument with small punctures along grooves, margins ornamented with hairs. Cervical and radial grooves distinct, caput somewhat elevated. Fovea transversely concave. AER recurved, PER almost straight. Chelicerae, palpi, endites and leg femora black-brown, other leg segments red-brown. Chelicerae with fang orange-yellow, promargin with two teeth and no retromarginal tooth (Fig. 7). Abdominal dorsum deep grayish black, covered with white-yellow hairs; with white forming a crescent pattern anteriorly, a series of small markings on the median line, and two pairs of markings laterally (Fig. 1). Center region of venter grayish black, with yellow-brown striae laterally. Spinnerets brown to yellow-brown, surrounded by white membranous ring. Epigynum subtriangular (Fig. 5), protruding posteromedially (Fig. 6), spermathecae ovoid, connective tube curved (Fig. 8).

Male.— Body coloration, patterns and eye arrangement as in female, only leg formula differs. Palpal bulb with S-shaped conductor (Fig. 3) enlarged at distal end (Fig. 2), embolus conical, tapered (Figs. 2, 4).

Measurements.— ♀ total length 7.45–11.20. ♂ 6.20–7.50. Holotype ♀ total length 9.90. Cara-pace length 2.70, width 2.00; abdomen length 6.50, width 5.70. Eye sizes and intervals: AME=ALE=PME=PLE 0.25; AME-AME =AME-ALE 0.05; PME-PME= PME-PLE 0.15; MOQ length 0.44, anterior width 0.50, posterior width 0.55; CH 0.55. Leg measurements: ♀ I: 4.30 + 4.75 + 3.50 + 1.70 = 14.15, II: 3.90 + 3.50 + 2.50 + 1.40 = 11.30, III: 2.60 + 2.90 + 2.00 + 1.20 = 8.70, IV: 3.50 + 4.50 + 3.30 + 1.80 = 13.10; leg formula I, IV, II, III. ♂ I: 5.30 + 5.50 + 4.10 + 1.90 = 16.80, II: 5.00 + 4.50 + 3.30 + 1.80 = 14.40, III: 3.50 + 3.50 + 2.50 + 1.50 = 11.00, IV: 4.70 + 4.90 + 3.90 + 1.90 = 12.40; leg formula I, II, IV, III.

Material Examined

China.— Yunnan: Baoshan Prefecture: pass over Gaoligongshan at 2100m. Nankang, 36 air km SE TengChong, 24°50′ N, 98°47′ E, native forest, 4–7 October 1998, C. Griswold, D. Kavanaugh and C.-L. Long (holotype ♀, paratype ♂, HNU No. 98-TC-7); native forest at 2300m, Luoshuidong, 28 air km E TengChong, 24°57′ N, 98°45′ E, flight trap over stream, 26–31 October 1998, C. Griswold, D. Kavanaugh and C.-L. Long (1♀1♂ CAS, 2♀ HNU No. 98-TC-6). Nujiang Prefecture: Nujiang State Nature Reserve, Qiqi He, 9.9 air km W Gongshan, 27°43′ N, 98°34′ E, 2000m, 9–14 July 2000, H.-M. Yan, D. Kavanaugh, C.E. Griswold, H.-B. Liang, D. Ubick and D.-Z. Dong (1& subadult HNU No. 00-QF-56).

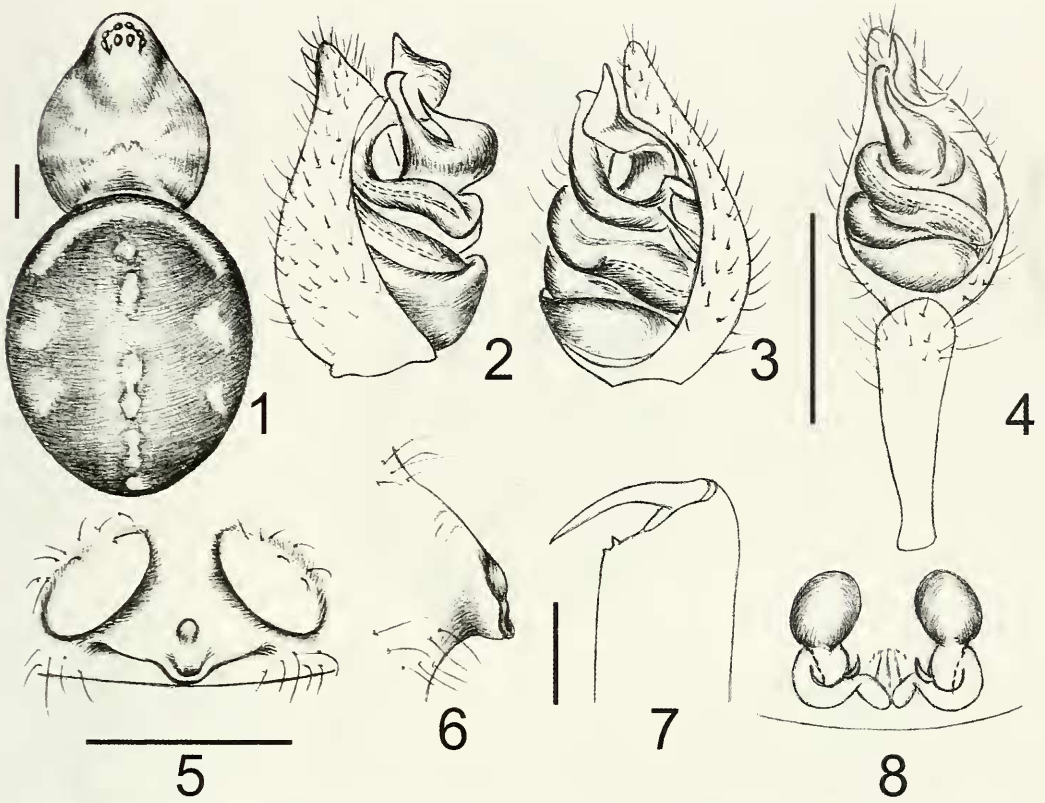
Steatoda pardalia, new species

Figures 9–13

Types.— Holotype ♀ and paratype ♂ from Gaoligongshan in Nujiang State Nature Reserve at 2775m near No. 12 Bridge Camp area, 16.3 air km W of Gongshan, 27°43′ N, 98°30′ E, Nujiang Prefecture, Yunnan Prov., China, collected 15–19 July 2000 by H.-M. Yan, D. Kavanaugh, C.E. Griswold, H.-B. Liang, D. Ubick and D.-Z. Dong, deposited in HNU (No. 00-QD-12).

Etymology.— The specific name refers to the abdomen dorsal pattern, which is similar to leopard's spots (Fig. 11).

Diagnosis.— This new species is very distinct from other Chinese *Steatoda*. The pale network

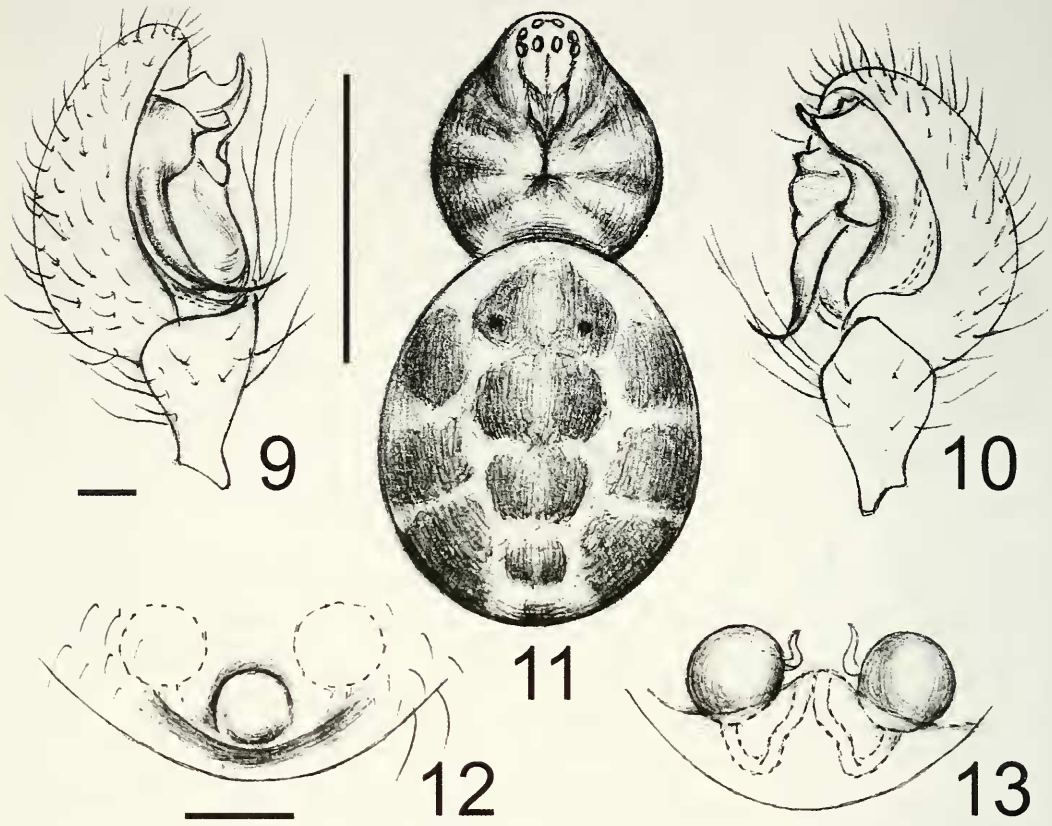


FIGURES 1–8. *Steatoda mainlingoides*, new species. 1, 5–8. Female. 2–4. Male left pedipalpus. 1. Habitus, dorsal. 2. Prolateral. 3. Retrolateral. 4. Ventral. 5. Epigynum, ventral. 6. Epigynum, lateral. 7. Chelicera, retrolateral. 8. Vulva, dorsal.

pattern on the abdominal dorsum (Fig. 11) is somewhat similar to *Steatoda tortoisea*, new species (Fig. 21), but *S. pardalia* can be distinguished by (1) lacking the epigynal scape (Fig. 12) characteristic of S. tortoisea (Fig. 22) and (2) the thick, meandering copulatory duct (Fig. 13) that differs from the short, curved duct of *S. tortoisea* (Fig. 23).

FEMALE.— Carapace brown, margin black-brown, lateral margins smooth. Cervical groove indistinct, head region slightly elevated. AER procurved, PER slightly procurved. Fovea transversely concave, two V-shaped markings behind eye region to fovea. Sternum brown, with hairs. Chelicera brown, promargin having three teeth and no retromarginal tooth. Endite and labium brown proximally, milk white distally. Palpi and legs yellow-brown but middle section of femora and distal ends of patellae and tibiae black-brown. Abdomen ovoid, dorsum gray-black, clothed with pale network pattern, dividing the dorsum into 11 black patches, five in middle and three on each side (Fig. 11). Abdomen brown ventrally with one pair of white scale markings. Periphery of spinnerets black-brown, colulus distinct, color same as spinnerets. Posterior margin of epigynum procurved, with thickened rim, rim of atrium protruding (Fig. 12). Spermathecae spherical, connective duct V-shaped, inner arm extending forward to atrium (Fig. 13).

MALE.— Habitus as in female except lateral margins of carapace serrate. Palpal bulb from prolateral view (Fig. 9) with anterior part of median apophysis robust, cubical, posteriorly elongate, curved into a sickle-shaped part, from retrolateral view (Fig. 10), embolus short, conical, accompanied by the conductor on its right side.



FIGURES 9–13. *Steatoda pardalia*, new species. 9, 10. Male left pedipalpus. 11–13. Female. 9. Prolateral. 10. Retrolateral. 11. Habitus, dorsal. 12. Epigynum, ventral. 13. Vulva, dorsal.

MEASUREMENTS.— ♀ total length 2.93. Carapace length 1.70, width 0.96; abdomen length 1.76, width 1.43. ♂ total length 2.85, Carapace length 1.11, width 1.00; abdomen length 1.74, width 1.36. Eye sizes and intervals: ♀/♂: AME=ALE 0.10, PME=PLE 0.11; AME-AME 0.04, AME-ALE 0.03, PME-PME 0.09, PME-PLE 0.04; MOQ length= anterior width 0.20< posterior width 0.23, carapace height ♀ 0.26, ♂ 0.23. Leg measurements: ♀ I: 1.20 + 1.34 + 0.89 + 0.69 = 4.12, II: 1.00 + 1.14 + 0.71 + 0.63 = 3.48, III: 0.91 + 0.94 + 0.54 + 0.60 = 2.99, IV: 1.14 + 1.30 + 0.80 + 0.63 = 3.87; leg formula I, IV, II, III. ♂ I: (missing) + 1.57 + 1.49 + (missing) = (not calculated), II: 1.29 + 1.11 + 0.80 + 0.59 = 3.79, III: 1.06 + 0.97 + 0.67 + 0.53 = 3.23, IV: 1.34 + 1.29 + 0.81 + 0.68 = 4.12; femur I probably longer than femur IV, leg formula probably I, IV, II, III.

DISTRIBUTION.— Yunnan, China.

MATERIAL EXAMINED

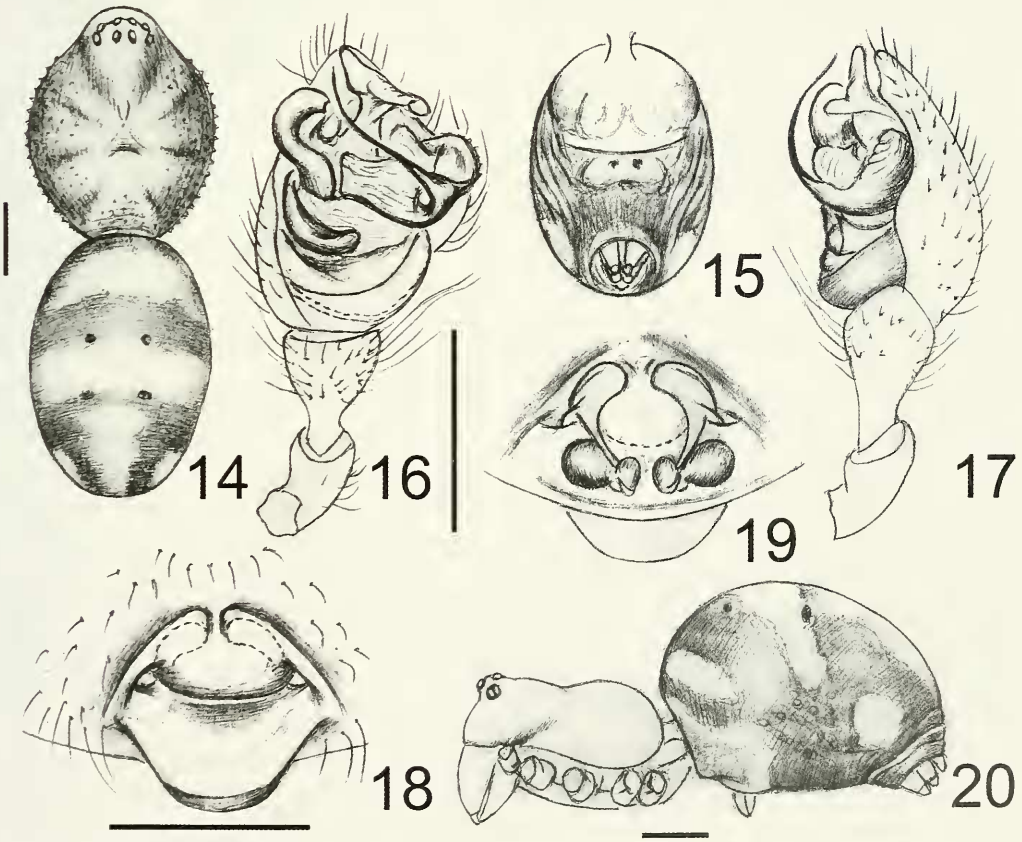
Only the types.

***Steatoda terastiosa* Zhu, 1998**
Figures 14–20

Steatoda terastiosa Zhu 1998:347, fig. 232A-C. Platnick 2002.

NOTE.— The male was described by Zhu (1998:346). We describe the female for the first time.

FEMALE.— Carapace, sternum, endites and labium flaming red (Fig. 20). Carapace clothed with short black hairs that are denser on the lateral margins than on the median. Cervical and radial grooves distinct, darker, caput elevated, with long black hairs. AER recurved, PER slightly recurved; bases of ALE and PLE contiguous. Clypeus protruding. Fovea shallow, subtriangular. Sternum with dense black hairs, triangular, posterior end long and pointed between coxae IV. Chelicerae red brown, with two small promarginal teeth and no retromarginal tooth. Distal ends of labium and endite pale white, endite with black margin. Palpal trochanter and coxa and trochanters of legs flaming red, remaining segments black-brown. Abdomen subspherical, dorsum brown with three distinct pairs of muscular depressions, the second largest and third smallest; white forming two transverse bands on anterior half, one longitudinal median band and one pair of round marks laterally on the posterior half (Fig. 14). Abdominal venter with large white, square mark before spinnerets, gray patches beside white mark and surrounding spinnerets; base of anal tubercle with regularly arranged brown hairs. Epigynum trapezoid, an ellipsoid atrium on anterior half, the pos-



FIGURES 14–20. *Steatoda terastiosa* Zhu, 1998. 14–17. Male. 18–20. Female. 14. Habitus, dorsal. 15. Abdomen, ventral. 16. Palpal organ, ventral. 17. Palpal organ, retrolateral. 18. Epigynum, ventral. 19. Vulva, dorsal. 20. Habitus, lateral.

terior half recurved, thickened, with black margin (Fig. 18). Spermathecae spherical, connecting duct anterior, funnel-shaped (Fig. 19).

Male.— (Figs. 14–17): Body smaller than female; for description see Zhu (1998:347, fig. 232A–C).

Measurements.— ♀ total length 11.43. Carapace length 3.43, width 2.97; abdomen length 5.77, width 5.09. Eye sizes and intervals: AME=ALE 0.17; AME-AME 0.11; AME-ALE 0.20. PME 0.19; PLE 0.21, PME-PME 0.14, PME-PLE 0.23, MOQ length 0.40, anterior width 0.43, posterior width 0.47; carapace height 0.29. Leg measurements: I: 4.06 + 4.69 + 3.57 + 1.83 = 14.15, II: 3.43 + 3.60 + 2.71 + 1.54 = 11.28, III: 2.91 + 2.86 + 2.09 + 1.31 = 9.17, IV: 4.37 + 4.63 + 3.31 + 1.66 = 13.97; leg formula: I, IV, II, III.

Distribution.— Yunnan, China.

Material Examined

China.— Yunnan Province: **Kunming Prefecture**: Kunming, Heilongtan District, Kunming Institute of Botany botanical gardens, 25°08′ N, 102°45′ E, 1950m, 21–23 June 2000, D. Kavanaugh and C.E. Griswold (2♀ HNU No. 00-KB-10, 1♀1♂ CAS).

Steatoda tortoisea, new species

Figures 21–23

Types.— Holotype ♀ from Nujiang, 30°06′ N, 97°12′ E, Yunnan Province, China, collected 30 July 1981 Jia-Fu Wang, deposited in HNU (No. 97-102). Paratype, 1♀ subadult, from Liuku, Nujiang Prefecture, Lushui Co., Liuku Township, 800m, 25°52′ N, 98°51′ E, Yunnan Prov., China, collected 25–26 June 2000 by D. Kavanaugh, C.E. Griswold, H.-M. Yan and D. Ubick, deposited in HNU (No. 00-LK-9).

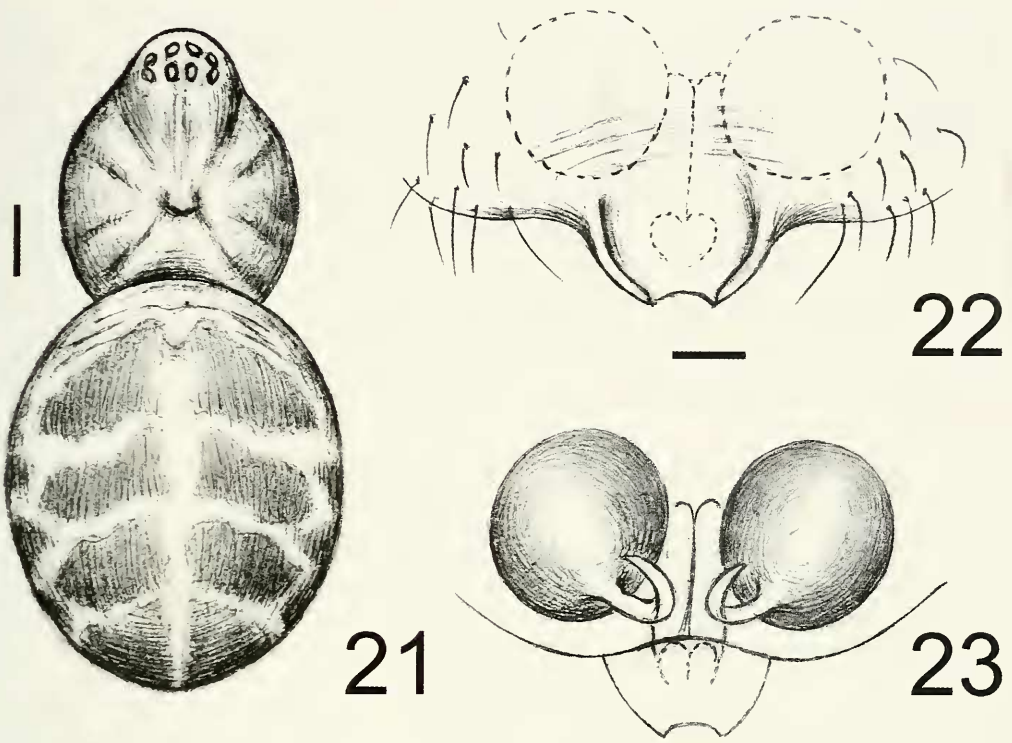
Etymology.— The specific name is derived from the tortoise shell-like pattern of the abdomen dorsum (Fig. 21).

Diagnosis.— The vulva is most similar to *Steatoda cingulata* (Thorell 1890), but *S. cingulata* lacks the scape characteristic of *S. tortoisea* (Fig. 22), and the abdominal patterns of these two species are distinct.

Female.— Carapace pear-shaped, red-brown to black-brown. Cervical groove clear, caput elevated. AER strongly recurved, PER almost straight. ALE and PLE contiguous at base. Fovea transversely concave, radial grooves indistinct. Thoracic region clothed with red-brown hairs. Sternum, chelicerae, endites and labium red-brown, chelicerae with 2 promarginal teeth and no retromarginal tooth. Labium wider than long. Palpi and legs red-brown to black-brown. Abdominal dorsum ovoid, black-brown, with tortoise shell-like pattern, three pairs of distinct muscle impressions, the second pair largest (Fig. 21). Abdominal venter brown, with a square white marking behind epigastric groove and a pair of pale subaxial striae, with ring-like mark surrounding the spinnerets. Epigynum with scape, its lateral margins turned up towards the median (Fig. 22). Vulva with two large spherical spermathecae (Fig. 23).

Male.— Unknown.

Measurements.— Holotype ♀ total length 9.27; carapace length 3.97, width 3.76; abdomen length 5.51, width 4.55. Eye sizes and intervals: AME=ALE=PME=PLE 0.23; AME-AME =PME-PLE 0.09; AME-ALE 0.06; PME-PLE 0.13; MOQ length 0.51, anterior width 0.49, posterior width 0.46; carapace height 0.17. Leg measurements: I: 4.50 + 5.20 + 3.50 + 1.40 = 14.60, II: 3.50 + 3.50 + 2.60 + 1.00 = 10.60. III: 2.60 + 2.50 + 2.05 + 1.05 = 8.20, IV: 3.90 + 4.55 + 3.40 + 1.05 = 12.90;



FIGURES 21–23. *Steatoda tortoisea*, new species, holotype female. 21. Habitus, dorsal. 22. Epigynum, ventral. 23. Vulva, dorsal.

leg formula: I, IV, II, III.

DISTRIBUTION.— Yunnan, China.

MATERIAL EXAMINED

Only the types.

ACKNOWLEDGMENTS

Support for this research came from the China Natural History Project, the Foundation of Natural Science of the Education Department of Hunan Province (China), the California Academy of Sciences and the US National Science Foundation grant DEB BSI 074632456. We are grateful to Prof. Heng Li and Prof. Chun-Lin Long for support for the 1998 and 2000 Sino-American-expeditions to the Gaoligong Mountains and to Prof. Zhi-ling Dao for organizing the expeditions. We also thank all the collectors who did the difficult fieldwork and provided us with specimens. This is Scientific Contribution no. 23 from the California Academy of Sciences Center for Biodiversity Research and Information (CBRI) and contribution no. 16 from the China Natural History Project (CNHP).

References

Platnick, N.I. 2002. *The World Spider Catalog*, version 2.5. American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

Zhu, M.S. 1998. *Fauna Sinica* (*Arachnida: Araneae: Theridiidae*). Science Press, Beijing: 324-347.